spores are differentiated and set free. The first partial differentiation and movement of the spore-origins is regarded as the counterpart of the first swarming period of the zoospores of the Saprolegniales. This view derives diplanetism from a more primitive state among the lower fungi, while there is nothing among the algae which corresponds to the phenomenon.

It is further pointed out that some other phenomenon, such as heterogamy, isogamy, and the proliferation of the sporangium, each have a primitive counterpart among the Chytridiales, and can be traced in a natural series to the Saprolegniales and Oomycetes. For some of the phenomena, like the proliferation of the sporangium, there is no counterpart whatever among the algae.—H. HASSELBRING.

Cultures of Uredineae.—In continuation of the long series of experiments in his cultural work on the Uredineae, the cultures made in 1908 have been reported by ARTHUR.[15] The most interesting result of the work of that year is the discovery that the aecidial stage of *Gymnosporangium externum* Arthur and Kern (described as new) occurs on a herbaceous perennial, *Porteranthus stipulatus* (Muhl.) Britton. This is the only case known of the occurrence of an aecidium of Gymnosporangium on a plant outside of the Pomaceae. Another unusual case is that of *G. Libocedri* (P. Henn.) Kern, whose aecidial stage is shown to be *Aecidium Blasdaleanum* D. and H., a true aecidium and not belonging to the Roestelia type as in all other Gymnosporangia. Series of cultures with 13 species of rusts gave negative results, and cultures with 23 species confirmed and supplemented work previously reported. The relations of the following species have been worked out for the first time: *Puccinia absinthii* DC. on *Artemisia dracunculoides* Pursh has no aecidia, but has pycnidia on the same host; *P. macrospora* (Peck) Arthur on *Carex comosa* Boott sown on *Smilax hispida* Muhl.; *P. patruclis* Arth. on *Carex pratensis* Dreej. sown on *Agoseris glauca* (Pursh) Green; *P. cinerea* Arth. on *Puccinellia airoides* (Nutt.) Wats. and Coult. sown on *Oxygraphis cymbalaria* (Pursh) Prantl; *P. Koeleriae* Arth. on *Koeleria cristata* (L.) Pers. sown on *Mahonia aquifolium* (Pursh) Nutt.; *P. alternans* Arth. on *Bromus Porteri* (Coult.) Nash sown on *Thalictrum dioicum* L.; *P. obliterata* Arth. on *Agropyron biflorum* R. and S. sown on *Aquilegia canadensis* L.; *P. Muhlenbergiae* Arth. and Holw. on *Muhlenbergia glomerata* Trin. sown on *Callirhoe involucrata* (T. and G.) A. Gray; *Gymnosporangium Libocedri* (P. Henn.) Kern on *Libocedrus decurrens* Torr. sown on *Crataegus Pringlei* Sarg.; and *G. externum* Arth. and Kern on *Juniperus virginiana* L. sown on *Porteranthus stipulatus* (Muhl.) Britt.—H. HASSELBRING.

Biology of Gymnosporangium.—Another interesting example showing the slight degree of differentiation existing among some species of parasitic fungi

[15] ARTHUR, J. C., Cultures of Uredineae in 1908. Mycologia 1:225–256. 1909.